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ABSTRACT

Designing open, flexible distance learning systems on the World Wide Web requires thoughtful analysis and investigation combined with an understanding of both the Web's attributes and resources and the ways instructional design principles can be applied to tap the Web's potential. A framework for open, flexible, and distributed learning has been developed to provide guidance in designing, developing, implementing, and evaluating instructional and training materials on the Web. The proposed framework is based on eight interrelated and interdependent dimensions and associated subdimensions as follows: (1) pedagogical (content, goals/objectives, design approach, methods and strategies, organization, instructional medium, evaluation); (2) technological (infrastructure, hardware, software); (3) interface design (page and site design, navigation, usability testing); (4) online support (instructional/counseling support, technical support); (5) management (maintenance of learning environment, distribution of information); (6) resource support (online resources, offline resources); (7) ethical (social and cultural diversity, geographical diversity, learner diversity, information accessibility, etiquette, legal issues); and (8) institutional (academic affairs, student services). The proposed framework is said to have the potential to provide guidance in designing Web-based learning materials; reviewing Web-based instruction and training courses; organizing resources for Web-based learning; designing comprehensive authoring systems; and designing distributed learning systems, virtual universities, and cyberschools. (Contains 45 references.) (MN)

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A Framework for Open, Flexible and Distributed Learning

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Workshop 1

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Abstract

Designing open, flexible distance learning systems on the Web requires thoughtful analysis and investigation, combined with an understanding of both the Web's attributes and resources and the ways in which instructional design principles can be applied to tap the Web's potential. Designing Web-based courses for flexible, open, and distributed learning environment is new to many of us. A Framework for open, flexible and distributed learning is introduced here to provide guidance in designing, developing, implementing, and evaluating instructional and training materials on the Web. Numerous factors help to create a meaningful learning environment, and many of these factors are systemically interrelated and interdependent. A systemic understanding of these factors can help designers create meaningful distributed learning environments. The proposed framework is developed by clustering these factors into eight dimensions: pedagogical, technological, interface design, online support, management, resource support, ethical and institutional. Each dimension has several sub-dimensions, each consisting of items focused on a specific aspect of a Web-based learning environment.

A Framework for Open, Flexible and Distributed Learning

INTRODUCTION

To stay viable in this global competitive market, providers of education and training must develop efficient and effective advanced distributed learning (ADL) systems to meet the society's needs. Therefore, there is a tremendous demand *for affordable, efficient, easily accessible, open, flexible, well-designed, learner-centred, distributed and facilitated learning environments*. Universities, corporations and government agencies worldwide are beginning to offer courses on the Web. At all levels of these institutions, students and employees are being encouraged to take Web-based courses.

Designing and delivering instruction and training on the Web requires thoughtful analysis and investigation, combined with an understanding of both the Web's attributes and resources (Khan, 1997c) and the ways in which instructional design principles can be applied to tap the Web's potential (Ritchie and Hoffman, 1997, cited in Khan, 1997b). Designing Web-based courses for flexible, open and distributed learning environments is new to many of us. We need a comprehensive framework that can provide guidance in designing, developing, implementing and evaluating instructional and training materials.

A FRAMEWORK FOR FLEXIBLE, OPEN, AND DISTRIBUTED LEARNING

With the Internet's rapid growth, the Web has become a powerful, global, interactive, dynamic, economic and democratic mediums of learning and teaching at a distance (Khan, 1997a). The Web provides an opportunity to develop learning-on-demand and learner-centred instruction and training. After reflecting on the factors that must be weighed in creating effective distributed learning environments, I developed a Framework for Advanced Distributed Learning (also known as a Framework for Web-based Learning) (Khan, 1997c). The seeds for the ADL framework (see Fig. 1) began germinating with the question "What does it take to provide best meaningful flexible learning environments for learners worldwide?"

Numerous factors help to create a meaningful learning environment, and many of these factors are systemically interrelated and interdependent. A systemic understanding of these factors can help designers create meaningful distributed learning environments. I clustered these factors into eight dimensions: pedagogical, technological, interface design, online

support, management, resource support, ethical and institutional. Each dimension has several subdimensions, each consisting of items focused on a specific aspect of a Web-based learning (WBL) environment (Dabbagh, Bannan-Ritlan and Silc, 2000). With so many items within each subdimension, this chapter only discusses important issues related to designing, developing, implementing and evaluating a WBL environment.

1. PEDAGOGICAL

The pedagogical dimension of Web-based learning refers to teaching and learning. This dimension addresses issues concerning *content, goals/objectives, design approach, Organisation, methods and strategies, medium* and *evaluation* of Web-based learning environments.

1.1 Content

The *content* has to do with a course's subject matter. This section addresses both the type and accuracy of the course content.

1.2 Goals/Objectives

For meaningful Web-based learning environments, it is important for learners to have clear goals/objectives, and ways to achieve them. This section reviews the presence and clarity of those goals and objectives.

1.3 Design Approach

The pedagogical philosophy used in the overall design of the course shapes the learning environment. The *instructivist* philosophy espouses an objectivist epistemology, whereas the constructivist approach emphasises the primacy of the learners' intentions, experiences and cognitive strategies (Reeves and Reeves, 1997). The selected design approach for Web-based learning activities are dependent on the type of domain of knowledge (i.e., well-defined and ill-defined) of the course content.

1.4 Methods and Strategies

Instructional methods/approaches and strategies can be used in WBL to facilitate learning or help students achieve their learning goals and objectives. The methods used in a Web-based course will be based in part on the philosophical approach of the course. A variety of instructional activities can be incorporated into Web-based

instruction and Web-based training to facilitate learning and the technical and structural attributes of the Web can be used to support these activities.

Discussion allows learners to share information, ideas and feelings among themselves and their instructors. Web-based discussions can be divided into two categories: asynchronous (time independent communication) and synchronous (real time communication). In a Web-based course, learners can be engaged in asynchronous discussions in three different formats: moderated discussion forums, unmoderated discussion forums, subject-related outside professional discussion forums. Asynchronous text communications tools are e-mail, mailing lists, newsgroups, etc.. Synchronous discussions can range from text-based to audio-video conferencing. Synchronous communications tools include messaging tools, and audio- and videoconferencing tools.

Facilitation gives mentors a chance to guide students, direct discussion, suggest possible resources, field questions, etc. (Bannan and Milheim, 1997). In a Web-based course, facilitation can be provided using various tools such as e-mail, mailing lists, discussion forums and conferencing tools.

1.5 Organisation

Web-based learning content should be organised with proper sequencing strategies (ordering of content) to help learners achieve their objectives and goals. In the presentation of contents, Web-based courses should always strive for clarity, style, readability and the usage of content relevant graphics (e.g., icons, buttons, pictures, images, etc.) and multimedia components (e.g., sound, audio, video, etc.).

1.6 Instructional Medium

In Web-based learning, the Web is the medium through which the message is communicated. The capabilities of the Web as a medium must be examined to see how its attributes and resources can be used effectively to facilitate learning (Khan, 1997a).

1.7 Evaluation

Online evaluation for WBL includes both *assessment of learners* and *evaluation of the instruction and learning environment* (Khan, 1997a).

Assessment of Learners

Assessment pertains to authenticity, reliability, formats (e.g., multiple choice, case studies, etc.), test characteristics (e.g., adaptive and randomised), etc. Assessment of learners at a distance can be a challenge. Issues of cheating are a major concern (Wheeler, 1999). "Are students actually doing the work?" (Hudspeth, 1997) and "How do we know we are assessing fairly and accurately?" (Wheeler, 1999) -- such questions will always be of concern for online learning environment.

Evaluation of Instruction and Learning Environment

The design of the course greatly influences the roles the instructors and students play in Web-based learning environment. This section deals with the performance of instructor and the review of learning environment (also discussed in *section 5.1 Maintenance of Learning Environment*).

2. TECHNOLOGICAL

The technological dimension examines issues related to *infrastructure, hardware* and *software* related to Web-based learning environments.

2.1 Infrastructure

Infrastructure for Web-based learning includes standards, policies and guidelines related to computer and related technologies, operating system, security, Internet connection and Internet services for instructors and learners.

2.2. Hardware

Hardware for Web-based learning may include computer, server, modem, networking devices, printer, scanner, camera, storage devices (e.g., hard drives, CD-ROM, etc.) and other equipment.

2.3 Software

Software for Web-based learning may include word processor, e-mail packages, presentation programme, spreadsheet, database, authoring tools, plug-ins, browsers, etc..

3. INTERFACE DESIGN

Interface design refers to the overall look and feel of a Web-based instructional and training programmes (Brandon, 1997). Interface design dimension encompasses *page and site design, navigation* and *usability*.

3.1 Page and Site Design

Page design relates to the physical appearance and clear functionality of the screen. Web-based learning environment should be designed to accommodate all learners, including people with disabilities, who encounter barriers due to poorly designed WBL. Images and videos without text alternatives are inaccessible to learners who are visually impaired for any reason.

3.2 Navigation

Navigation in a Web-based course should focus on how learners can move through the site with ease and reasonable speed. Clarity and consistent use of textual, graphic, and other Organisational markers throughout the site can contribute to the ease of use and speed (Simich-Dudgeon, 1998).

3.3 Usability Testing

Usability testing is a method of testing WBL to improve its interface design. Reeves and Carter (2000) categorise usability testing as follows: efficiency (i.e., cost and time saving), user satisfaction (i.e., ease of use, intuitiveness, visual appeal, etc.), and effectiveness (i.e., user retention over time). Guidelines for designing usable graphical user interfaces and Web pages can be found at: www.useit.com.

4. ONLINE SUPPORT

Both technological and human-based support throughout a Web-based course can help a course maintain momentum and become successful (Hill, 1997). This dimension deals with how a Web-based course can provide both *online instructional/counselling* support and all-purpose *technical* troubleshooting.

4.1 Instructional/Counselling Support

Guidance on study skills, time management and stress management are important components for WBL. Students should receive guidance on how to organize for online learning. Web-based learning method can be stressful for some students. It

would be very useful and beneficial for students to receive some guidance on time and stress management, note taking, reading and writing guides, test anxieties, health and wellness, etc..

4.2 Technical Support

Online technical support is one of the most important support services for Web-based learning environments. Technical support services must be available to help students log on, upload and download files, etc..

5. MANAGEMENT

Management of WBL courses involves various individuals who are responsible for doing specific tasks and training. These individuals may include instructors, tutors, subject matter experts, project managers, instructional designers, editors, interface designers, course developers, graphic artists, media production specialists, programmers, consultants, Webmaster, etc.. A co-ordinated and co-operative effort by these individuals will result in the effective management of a WBL course. Issues in this dimension are clustered into two categories: *maintenance of learning environment* and *distribution of information*.

5.1 Maintenance of Learning Environment

Maintenance of the learning environment covers staffing, management of course content and learning resources, mechanisms for evaluation, and security measures etc..

5.2 Distribution of Information

Information distribution covers the delivery of both online and off-line Web-based learning materials including schedule, syllabus, announcements, course relevant contact information, learning and testing materials and students' grades from quizzes, assignments, exams, and projects. Students can access to testing materials and their grades by entering their password.

6. RESOURCE SUPPORT

The resource support dimension of the ADL framework examines the *online* and *offline resources* required to support learning. These resources include original documents, public domain books, summaries of or discussions about books in print, reference works (such as foreign-language dictionaries), scholarly papers, new

concepts, notification of both face-to-face and online conferences, job information etc..

6.1 Online Resources

Online resource can include multimedia archives, mailing lists and their archives, newsgroups and their FAQs, dictionaries, Webliographies, recommended reading lists (e.g., BooksToRead.com), databases, online libraries, computer tutorials, experts online, electronic books, journals, magazines, newsletters, newspapers, documents etc..

6.2 Offline Resources

Offline resource can include books, journals, magazines, newsletters, newspapers, documents, reference works, experts, etc.. Institutions offering Web-based courses to geographically dispersed remote learners should provide suggestions or information about where to find library resources since many cannot use the host institution's library because of distance. Also, the host institution should consider joining a consortium of libraries worldwide so that their Web-based students can visit and loan books.

7. ETHICAL

Ethical considerations of Web-based learning relate to *social and cultural diversity, geographical diversity, learner diversity, information accessibility, etiquette* and the laws relating to these issues.

7.1 Social and Cultural Diversity

It is wonderful to be able to offer Web-based courses to global learners with different social, cultural, economic, linguistic and religious backgrounds. In designing Web-based learning environments, we should recognise the diversity of culture and learning styles in order to enable diverse learners to enhance their learning (Sanchez and Gunawardena, 1998).

7.2 Geographical Diversity

The use of appropriate date and time conventions in a Web-based course provides orientation for a widely distributed group of students. I recommend the use of the full-text dating convention (e.g., March 1, 2000 instead of 01-03-2000) and GMT,

especially when arranging conference calls, online conferences and other collaborative activities.

7.3 Learner Diversity

A Web-based learning system should be designed to accommodate the needs of individuals with disabilities, including senior citizens whose hearing is impaired; in the US alone, it has been estimated that there are more than 30 million people with disabilities -- inborn, acquired and temporary.

7.4 Information Accessibility

In information society, information accessibility is a critical issue which must be discussed in terms of the gap between the digital "haves" and "have nots, "a gap expressed in the term "digital divide." In designing Web-based learning activities, digital divide issues should be considered to include the learners who are affected by this division.

7.5 Etiquette

A Web-based learning environment should have the guidelines for etiquette when students post messages on discussion forums and newsgroups. Etiquette provides rules for maintaining civility in interactions and covers issues associated with considerate behaviour. The etiquette promotes mutually respectful behavior in an online learning community.

7.6 Legal Issues

This section deals with legal matters such as privacy, plagiarism and copyright.

8. INSTITUTIONAL

It is vital for institutions of higher education to have clear strategies for online learning. These strategies must be supported by institutions' missions. Online learning initiatives require orchestration of personnel with diverse skills sets (Belanger and Jordan, 2000). Political factors often have significant impact upon the success of an online programme (Berge, 2000). The institutional dimension is concerned with issues of *academic affairs* and *student services* related to Web-based learning.

8.1 Academic Affairs

Academic affairs encompass faculty and staff support, instructional affairs admissions, registration and payment (e-commerce), academic computing services, graduation and alumni affairs, etc..

8.2 Student Services

Students taking Web-based courses should enjoy the equal academic and student services as those taking face-to-face courses. These services include orientation, bookstore, library support, financial aids, counselling and other student support services. For Web-based learners, institutions should consider providing toll-free numbers for all of these services.

USING THE FRAMEWORK

The framework has the potential to provide guidance in designing Web-based learning materials, reviewing Web-based instruction and training courses (BooksToRead.com/wcr), organising resources for Web-based learning, designing comprehensive authoring systems, designing distributed learning systems, virtual universities and cyberschools. In my Web-based training (2000) book, the framework is used as the guiding mechanism for the following chapters:

- *Case Studies of Web-based Training Sites* by Khan, Waddill, and McDonald.
- *Pedagogy and Web-based course authoring tools: Issues and implications* by Dabbagh, Bannan-Ritland and Silc.
- *AuthorWeb- A conceptual framework for Web-based authoring system* by Khan, Ealy and Singh.
- *Web-based training resources* by El-Tigi and Khan.

CONCLUSION

I hope, by describing various dimensions of the framework, I have provided a sketch of what it takes to create meaningful distributed learning environments. I believe various issues discussed in the eight dimensions of the framework can provide guidance in the design, development, delivery and evaluation of distributed learning environments. Various sub-dimensions and issues discussed within the eight dimensions of the framework are by no means complete. I welcome comments and suggestions for improvement (BooksToRead.com/framework).

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